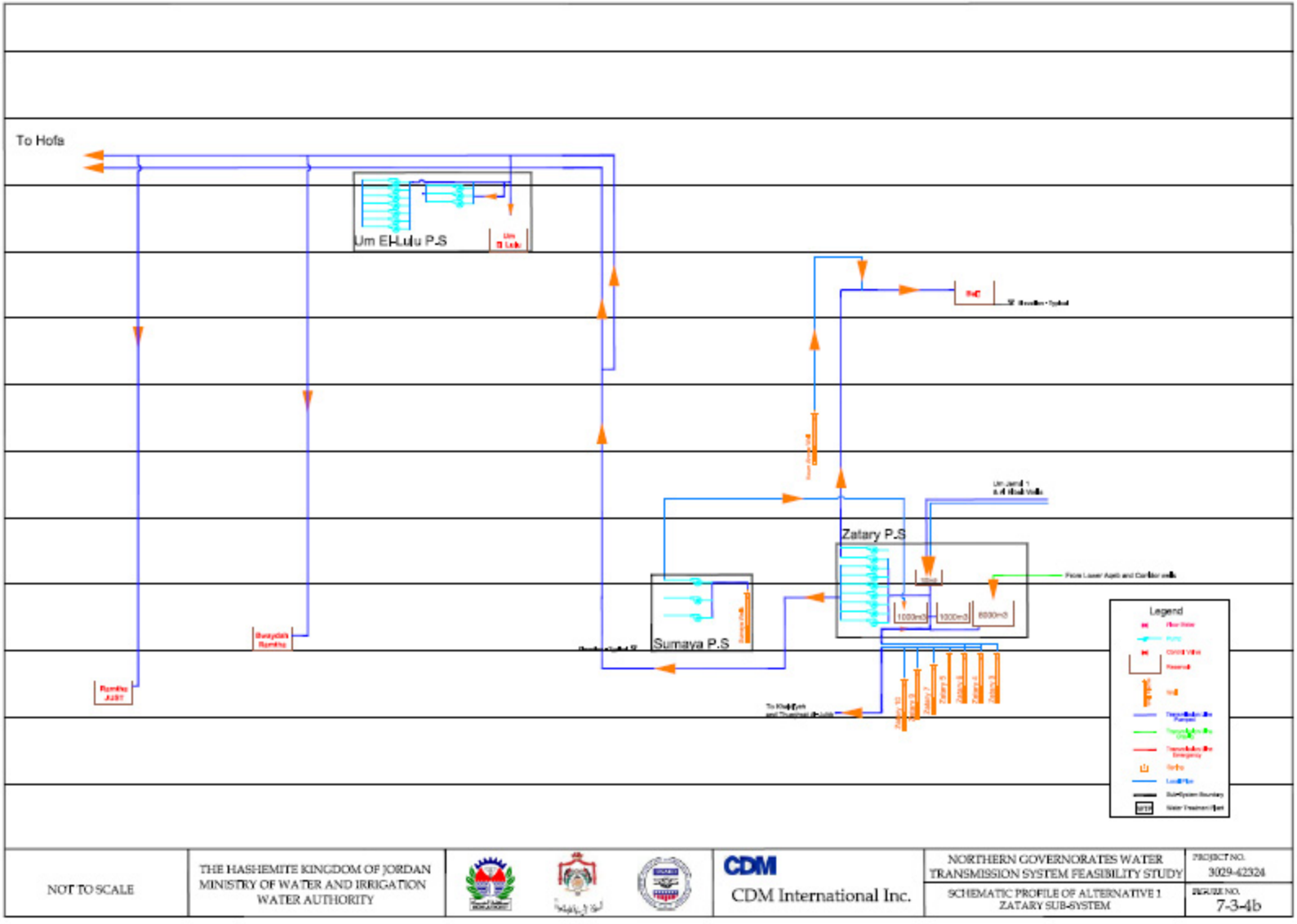
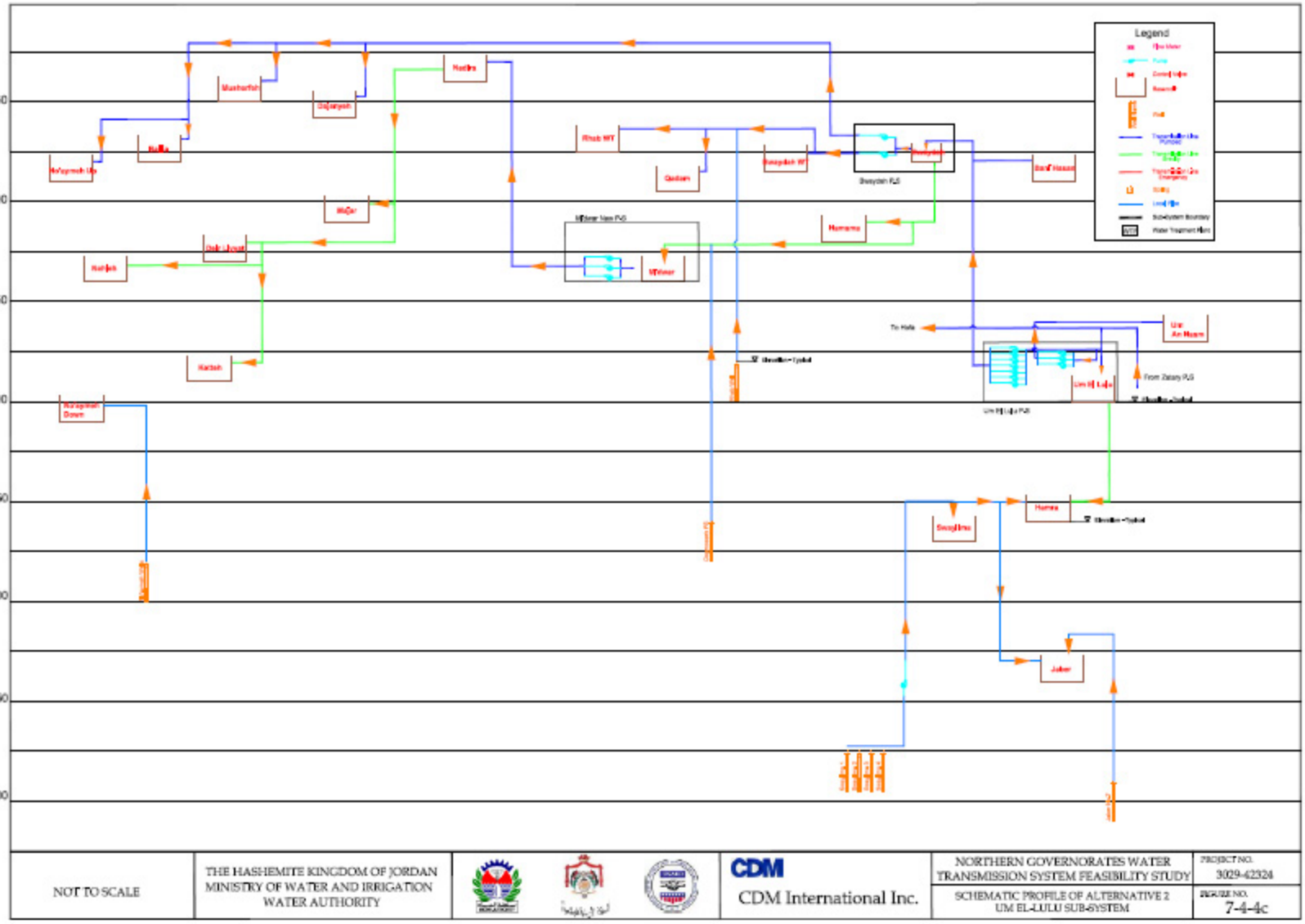


NOT TO SCALE	THE HASHEMITE KINGDOM OF JORDAN MINISTRY OF WATER AND IRRIGATION WATER AUTHORITY		CDM International Inc.	NORTHERN GOVERNORATES WATER TRANSMISSION SYSTEM FEASIBILITY STUDY SCHEMATIC PROFILE OF ALTERNATIVE 1 ZATARY SUB-SYSTEM	PROJECT NO. 3029-42324 FIGURE NO. 7-3-4b



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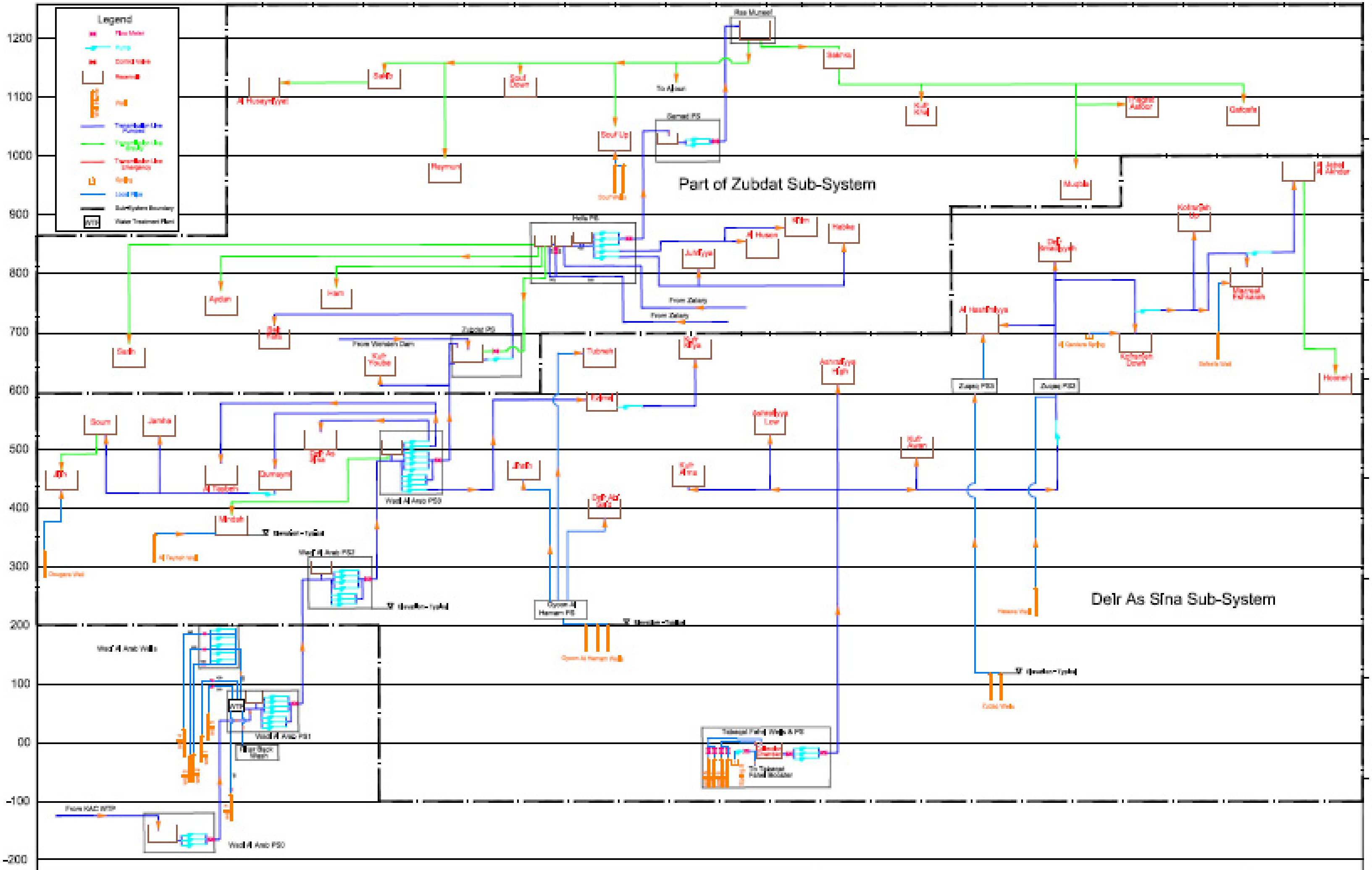

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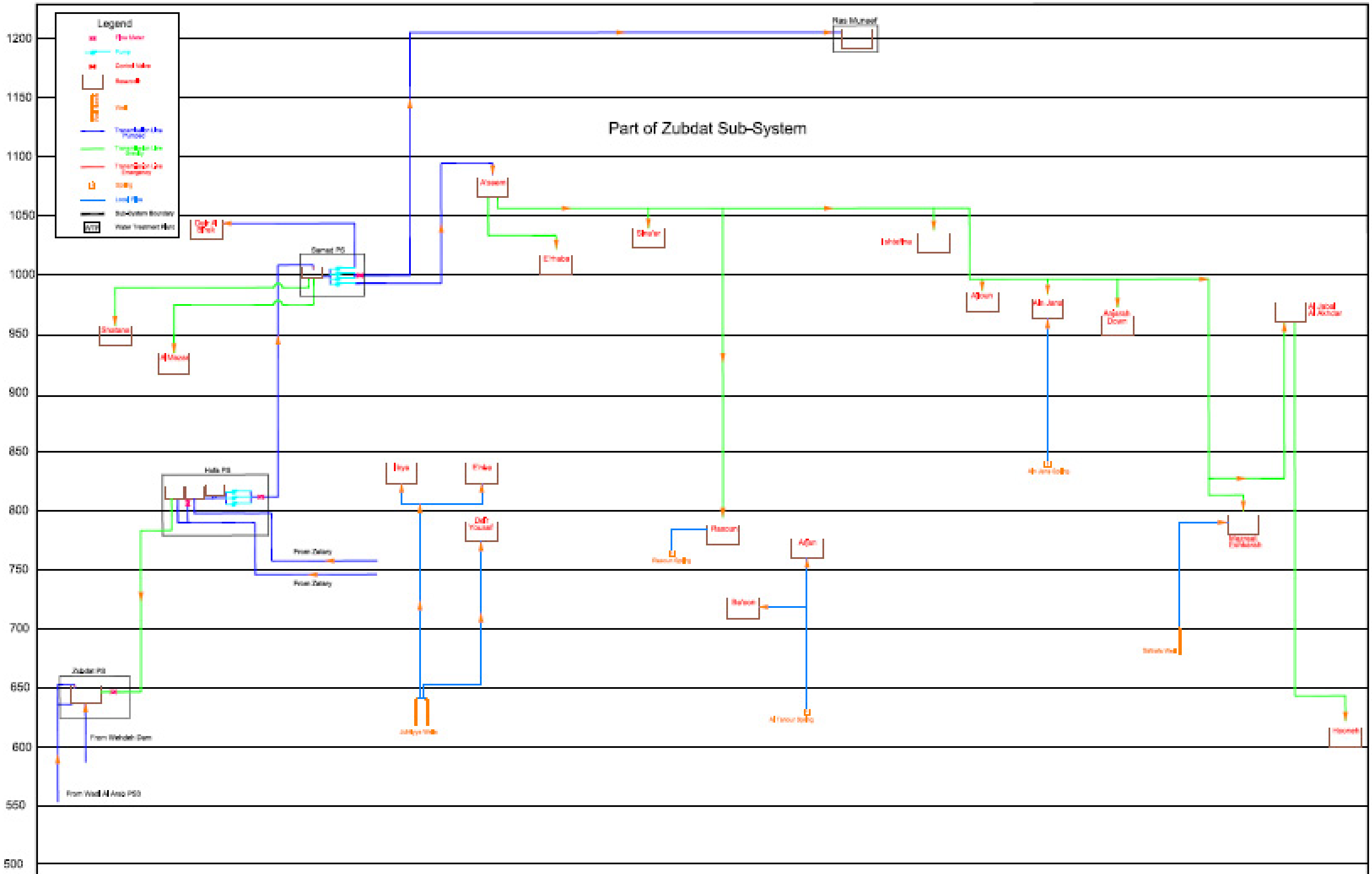
			PROJECT NO. 3029-42324 FIGURE NO. 7-4-4d



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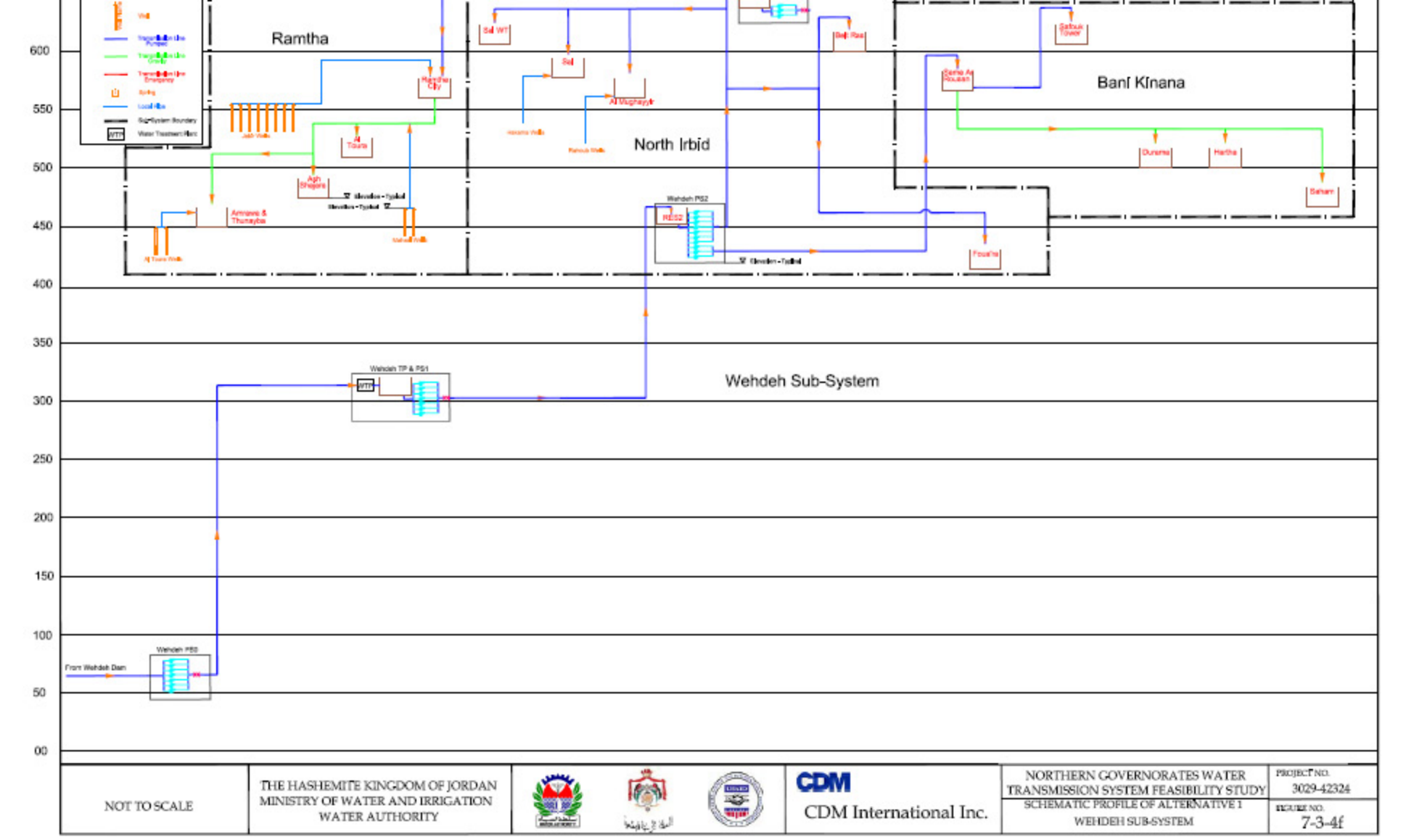
SCHEMATIC PROFILE OF ALTERNATIVE 1
ZUBDAT (PART2) SUB-SYSTEM

PROJECT NO.
3029-42324

FIGURE NO.
7-3-4e



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7.4 TRANSMISSION ALTERNATIVE 2

7.4.1 Guidelines

- Reduce pumping from Tabaqat Fahel and Mafraq
- Reduce number of pumping stations where possible.

7.4.2 Description

Alternative 2 is basically an amended version of Alternative 1, updated so as to meet the guidelines assigned for it. **Figures 7-4-1 and 7-4-2** show a layout of the suggested Alternative 2 transmission system and a layout of the locations of the existing and new pipelines respectively.

The description offered in this part of the chapter will only highlight the changes that have been introduced under this alternative.

East Transmission

Zatary Sub-System: (See plan and schematic profile on **Figures 7-4-3b and 7-4-4b** respectively). The Zatary sub-system has been extended to combine its original components with the two previously independent sub-systems of Khaldiyeh and Sumaya. In this alternative the existing Zatary PS is pumping water in four directions, which include, Baij, Sarhan, Khaldiyeh and Thughrat Al-Jubb and finally the main pipeline going towards Um El-lulu and Hofa.

Upper-Aqeb – Mafraq Sub-System: (See plan and schematic profile on **Figures 7-4-3a and 7-4-4a** respectively). Some major changes have occurred with regards to the Upper Aqeb – Mafraq Sub-System. The Upper Aqeb wells are still being used to serve this sub-system; Sumaya wells which have been freed from the previous Sumaya sub-system, will now be completely directed to the new Mafraq PS and its related sub-system. To reduce pumping, and since the PS is already pumping to areas of elevation reaching 820m, Upper Aqeb – Mafraq sub-system extends to serve the 'lower pressure zones' of Jerash. These include Jerash Up (750m), Jerash Down (645m), Souf Refugee Camp (740m), and Burma Up (750m) and Burma down (650m) reservoirs.

Um El-Lulu Sub-System: (See plan and schematic profile on **Figures 7-4-3c and 7-4-4c** respectively). Minimal changes occurred to this system as a result of the reallocations that took place in the previous two sub-systems.

The first change is that affected by the reallocation of the Sumaya wells, which generated the need to connect Hamra (750m), Swaylima (730m) and Jabir (660m) reservoirs to the system so as to replace the reallocated Sumaya source. The suggestion was to serve them by gravity from Um El-Lulu reservoir (800m).

The other change is that caused by the reallocation of the lower Jerash reservoirs to the Upper Aqeb – Mafraq sub-system. This again serves the principle of the alternative by reducing the amount of water that needs to be pumped up all the way to Bwaydah PS to serve these lower zones.

West Transmission

Schematic profiles in **Figures 7-4-4d, 7-4-4e, and 7-4-4f** show the new water subsystems considered in Alternative 2. The basics of this alternative are similar to those of Alternative 1 with a few amendments introduced to follow the guidelines of this alternative. This section will only deal with the changes that were introduced.

Wadi Al Arab and Deir As Sina Sub-systems: (See plan and schematic profile on **Figures 7-4-3d and 7-4-4d** respectively). A new set of pump stations and associated pipelines are suggested in the Tabaqat Fahel area. The sub-system serves Al Koura through a 500mm pipe which reaches Ashrafiyya area and then distributes the water in three directions. The first is sent to the north to feed Ashrafiyya Low and Kufr Alma reservoirs. The second goes towards Ashrafiyya High reservoir, while the third goes to the south to feed Kufr Awan reservoir continuing to serve the western parts of Ajloun (low reservoirs) similar to Alternative 1. As it gets closer to Kofranja Down reservoir, a new branch is taken to Kofranjah Up which serves Mazraat Eshkarah, Al Jabal Al Akhdar and Hooneh. This separates the southern part of Al Koura from the northern part, which in this alternative is served from Oyoon Al Hamam (Jinnin, Tubneh, and Deir Abi Said reservoirs) and Wadi Al Arab PS3.

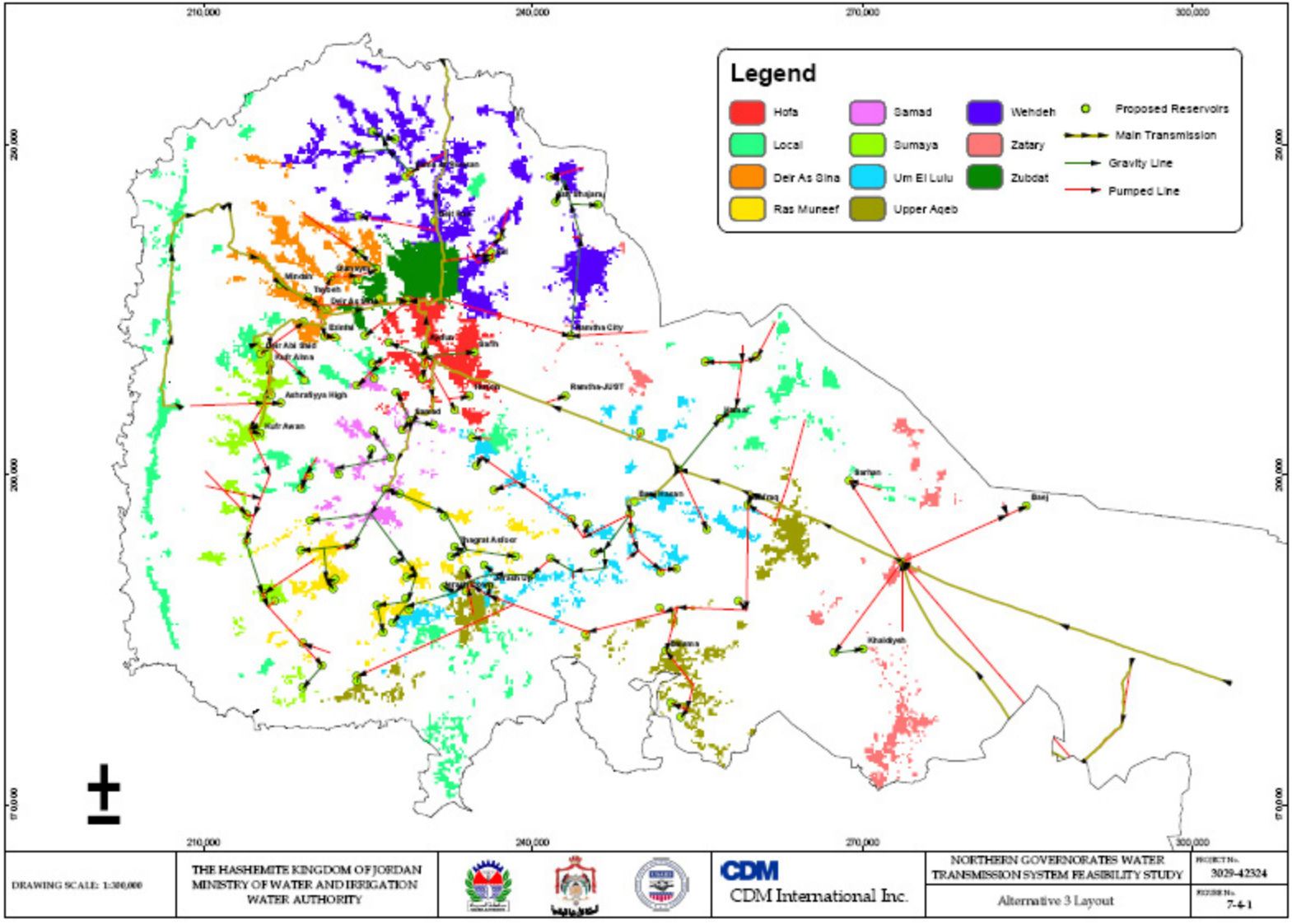
The two pump stations of Jinnin and Kufr Alma which were used in Alternative 1 are no longer needed in this alternative. However, three new pump stations were added to raise water from Tabaqat Fahel springs through the new proposed pipeline and route.

Zubdat subsystem: (See plan and schematic profile on **Figures 7-4-3e, 7-4-4d and 7-4-4e** respectively). The amount of water flowing from Wadi Al Arab PS3 is reduced as a result of the changes mentioned in the previous sub-system. The branch from Hofa feeding Al Huson reservoirs also serves Kitim reservoir. This reduces the head required from Bwaydah PS which was responsible for serving Kitim in Alternative 1. To reduce the number of pump stations in line with the guidelines of this alternative, Ras Muneef is now responsible for a bigger part of the reservoirs in Ajloun, unlike Alternative 1 where parts of it were served from Samad PS and some new suggested PSs.

The pipeline serving Jerash from Ras Muneef is increased to 500mm in order to serve a larger area through three branches:

- The first serves parts of Jerash;
- The second serves Ishtafina reservoir; and
- The third feeds Ain Jana, Ajloun, Anjara Down and Anjarah Up reservoirs, followed by parts of Jerash and Ajloun.

Wehdeh subsystem: (See plan and schematic profile on **Figures 7-4-3f, and 7-4-4f** respectively). No change in this sub-system from the sub-system in alternative 1.



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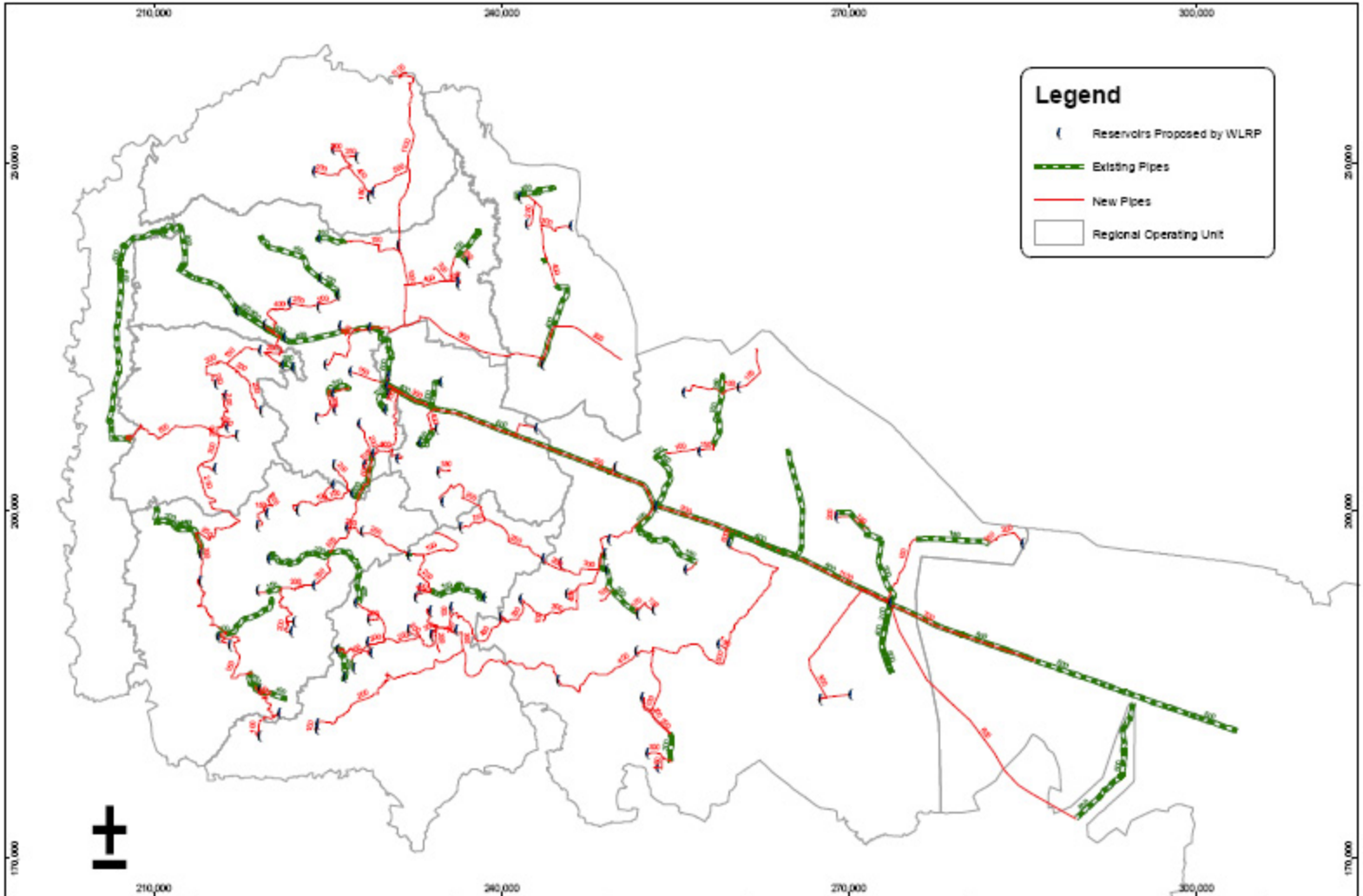
				Alternative 3 Layout	FIGURE No. 7-4-1



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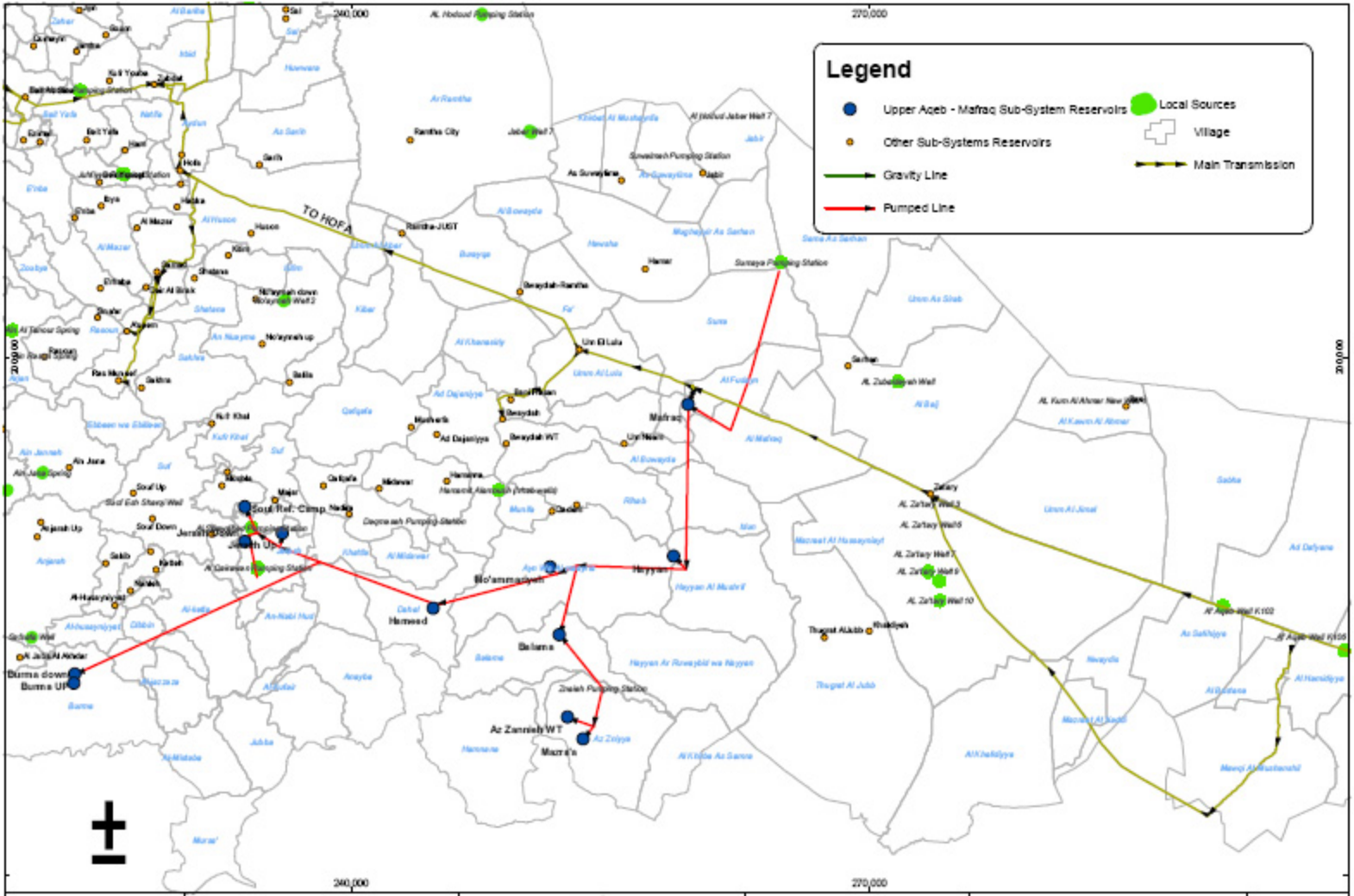
				Alternative 2 Existing / New Pipelines Layout	REVISION No. 7-4-2



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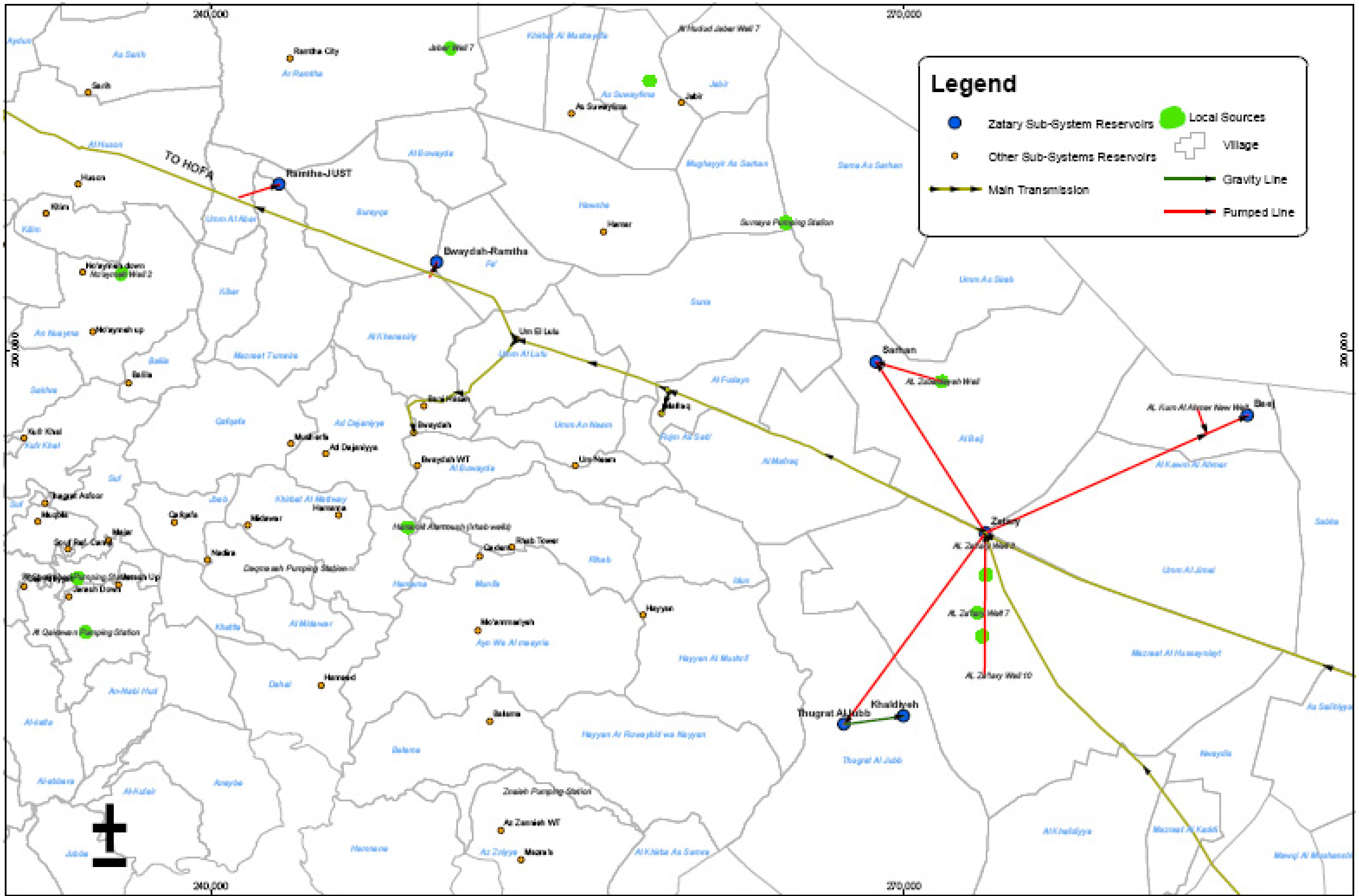

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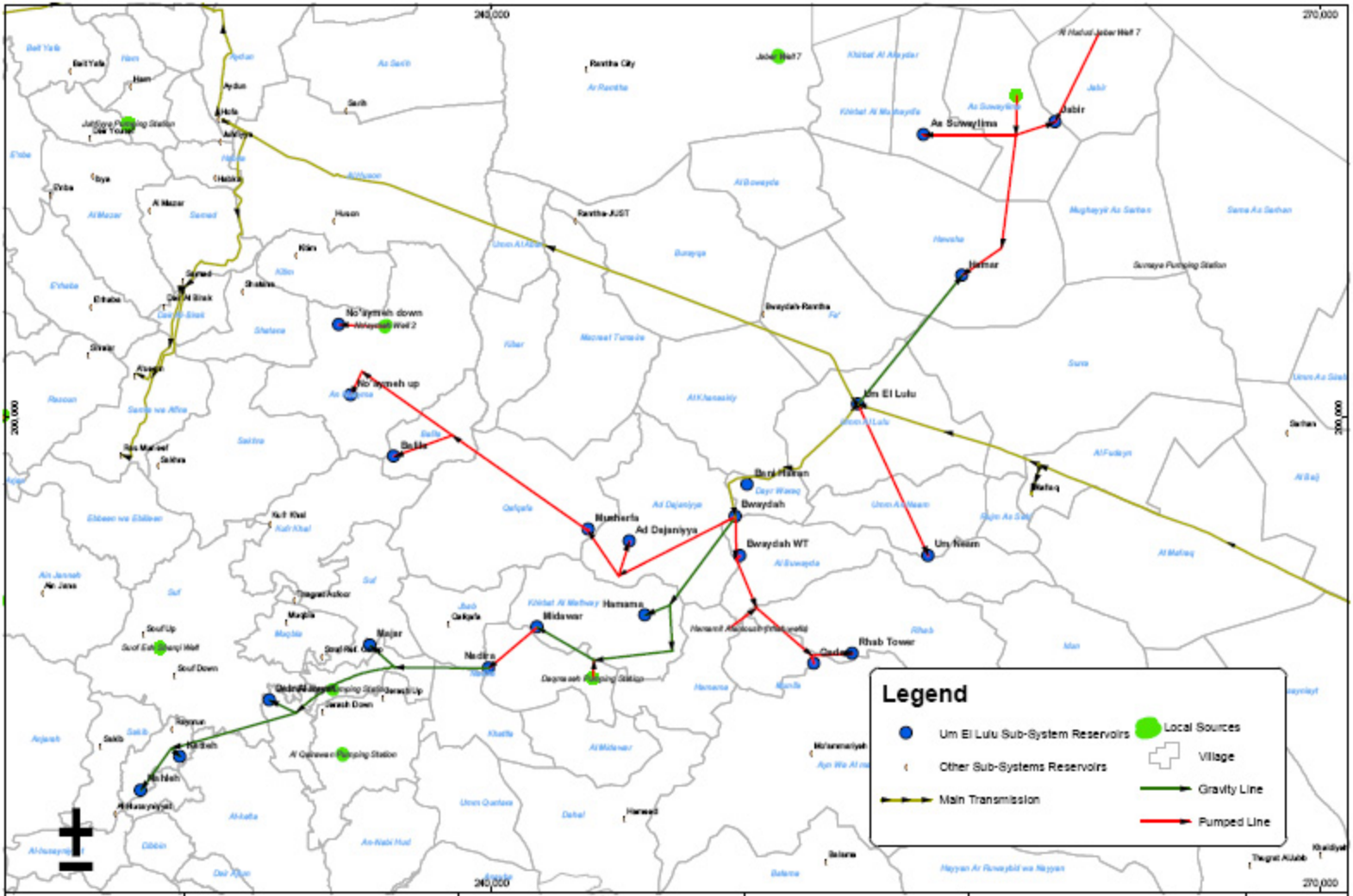
			Alternative 2: Zatary Sub-System Plan	FIGURE No. 7-4-3b



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Alternative 2: Um El-Lulu Sub-System Plan

FIGURE No. 7-4-3c